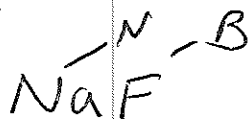


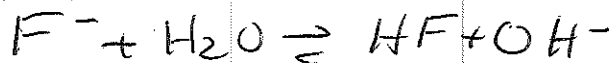
AP Chemistry
Salts and Buffers

1. Salt in question: NaF. K_a for HF = 6.7×10^{-4}

a. Is this salt acidic/basic or neutral?



b. Write the hydrolysis reaction.



c. Write the equilibrium expression for "b".

$$K_b = \frac{[HF][OH^-]}{[F^-]}$$

d. Write the hydrolysis reaction for the conjugate.



e. Write the equilibrium expression for "d".

$$K_a = \frac{[H_3O^+][F^-]}{[HF]}$$

f. In a .1M NaF solution what is the pH?

$$\frac{1.0 \times 10^{-14}}{6.7 \times 10^{-4}} = 1.49 \times 10^{-11} = \frac{x^2}{0.1} \quad x = 1.2 \times 10^{-6}$$

$$-\log(x) = 5.9 \quad 14 - () = 8.08$$

g. What is the percent dissociation for "f".

$$\frac{1.2 \times 10^{-6}}{0.1} \times 100 = 0.0012\%$$

h. Estimate or calculate the pH of the following solutions.

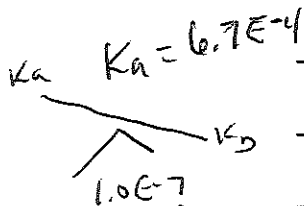
- [HF] = 0.1M [NaF] = 0.1M pH = $-\log(K_a) = 3.17$

- [HF] = 1.5M [NaF] = 1.5M pH = 3.17

- [HF] > [NaF] estimate pH (acidic/basic/neutral/need more info)

- [HF] = [NaF] estimate pH (acidic/basic/neutral/need more info)

- [HF] < [NaF] estimate pH (acidic/basic/neutral/need more info)



Buffer: A weak acid/base conjugate competing against each other.

i. To a beaker a 1M HF and 1 M NaF is added.

a. Considering the K_a value will this solution be acidic/basic or neutral?

→ Acidic

b. What is the pH?

3.17

$$K_a = 6.7 \times 10^{-4} = \frac{1 \cdot x}{1}$$

$$x = 6.7 \times 10^{-4} \Rightarrow -\log(x) = 3.17$$

c. If you want to make a solution that is basic which will be in higher concentration, NaF or HF? Explain?

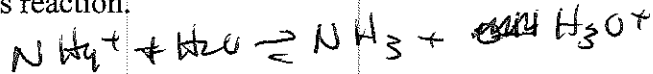
must be higher, much higher, due to large K_a .

2. Salt in question: NH_4Cl . K_a for $\text{NH}_4^+ = 5.6 \times 10^{-10}$

a. Is this salt acidic/basic or neutral?

NH_4^+ acidic

b. Write the hydrolysis reaction.



c. Write the equilibrium expression for "b".

$$K_a = \frac{[\text{NH}_3][\text{H}_3\text{O}^+]}{[\text{NH}_4^+]}$$

d. Write the hydrolysis reaction for the conjugate.



e. Write the equilibrium expression for "d".

$$K_b = \frac{[\text{NH}_4^+][\text{OH}^-]}{[\text{NH}_3]}$$

f. In a .1M NH_4Cl solution what is the pH?

$$5.6 \times 10^{-10} = \frac{x \cdot x}{0.1}$$

~~5.6E-10~~
 $x = 10^{(7.4 \times 10^{-6})}$
 $-\log(x) = \text{pH} = 5.12$

g. What is the percent dissociation for "f".

~~5.6E-10~~
 $\frac{7.4 \times 10^{-6}}{0.1} \times 100 = 0.0074\%$

Buffer: A weak acid/base conjugate competing against each other.

h. To a beaker a 1M NH_4Cl and 1 M NH_3 is added.

d. Considering the K_a value will this solution be acidic/basic or neutral?

$$K_a = \frac{1 \cdot x}{1}$$

$x = 5.6 \times 10^{-10}$
 $-\log(x) = 9.25$

e. What is the pH?

f. If you want to make a acidic solution which will be in higher concentration, NH_3 or NH_4Cl ? Explain

↑
 much higher
 due to ↑ K_b or ↓ K_a